MODEL 290

BATH - WHIRLPOOL, MOBILE, ARM, LEG, AND HIP TREATMENT

NSN 6530-01-206-6016

DLA 120-90-C-8510 OCTOBER 1989

MAINTENANCE MANUAL
AND
OPERATING INSTRUCTIONAL MANUAL

FSCM - 16835

FERNO ILLE, A DIVISION OF:

FERNO-WASHINGTON, INC.
70 WEIL WAY
WILMINGTON, OH 45177-9371

MODEL 100
TURBINE, HYDROTHERAPY

OPERATION/MAINTENANCE MANUAL

Section 1 Table of Contents.

Section	2	Introduction.	2-1
	2.1	Preface.	2-1
	2.2	Proprietary Notice.	2-1
	2.3	Model 100 Information.	2-1
	2.4	Specifications.	2-1
	2.5	Component Identification.	2-2
Section	3	Equipment Operation.	3-1
	3.1	Unpacking the Unit .	3-1
	3.2	Installation.	3-1
	3.3	Safety Precautions	3-1
	3.4	Start-up Procedure.	3-1
	3.5	Operation.	3-2
	3.6	Shut-down Procedures.	3-2
Section	4	Maintenance and Repair.	4-1
	4.1	Cleaning and Disinfection.	4-1
	4.2	Scheduled Maintenance.	4-1
	4.2.1	Maintenance Schedule.	4-1
	4.2.2	Current Leakage and Dielectric Testing.	4-3
	4.3	Disassembly and Internal Cleaning.	4-4
	4.4	Troubleshooting.	4-5
	4.4.1	Turbine Stops While in Use.	4-5
	4.4.2	Turbine Will Not Start.	4-5
	4.5	Parts.	4-5
	4.5.1	Parts Ordering Information.	4-5
	4.5.2	Parts List.	4-6
	4.6	Maintenance Log.	4-8
Section	5	Limited Warranty.	5-1

Section 2 Introduction

2.1 Preface

This manual contains operation, maintenance, and service information for the Ferno Ille Model 100 Electric Turbine Ejector.

The drawings of sub-assemblies are aids to the identification, disassembly, and assembly of the turbine. Each parts list provides the necessary information to order replacement parts, parts assemblies, or kits.

NOTE: It is the user's responsibility to coordinate the power and plumbing requirements for installation with the contractor, maintenance, or engineering department for product installation where applicable.

2.2 Proprietary Notice

The information and design disclosed herein were originated by and are the property of Ferno Ille, a division of Ferno Washington, Inc.. Ferno Ille and Ferno Washington, Inc. reserve all patents, proprietary design, manufacturing, reproduction use, and sales rights thereto and to any articles disclosed therein, except to the extent that rights are expressly granted to others. The foregoing does not apply to vendor proprietary parts.

Specifications remain subject to change to allow the introduction of design improvements.

2.3 Model 100 Information.

NOTE: Ferno Ille turbines are Underwriters Laboratories listed. Accordingly, they will conform to the UL "Standards for Safety-Medical and Dental Equipment" (UL 544 - October 24, 1986) and are classified as "Patient Care Equipment."

"Patient Care Equipment" is defined as: "Equipment that is intended to be used on or with, or likely to be contacted by a patient in a health care facility in the course of his treatment."

Grounded patient care equipment is permitted to have a maximum current leakage of 100 microamperes to ground.

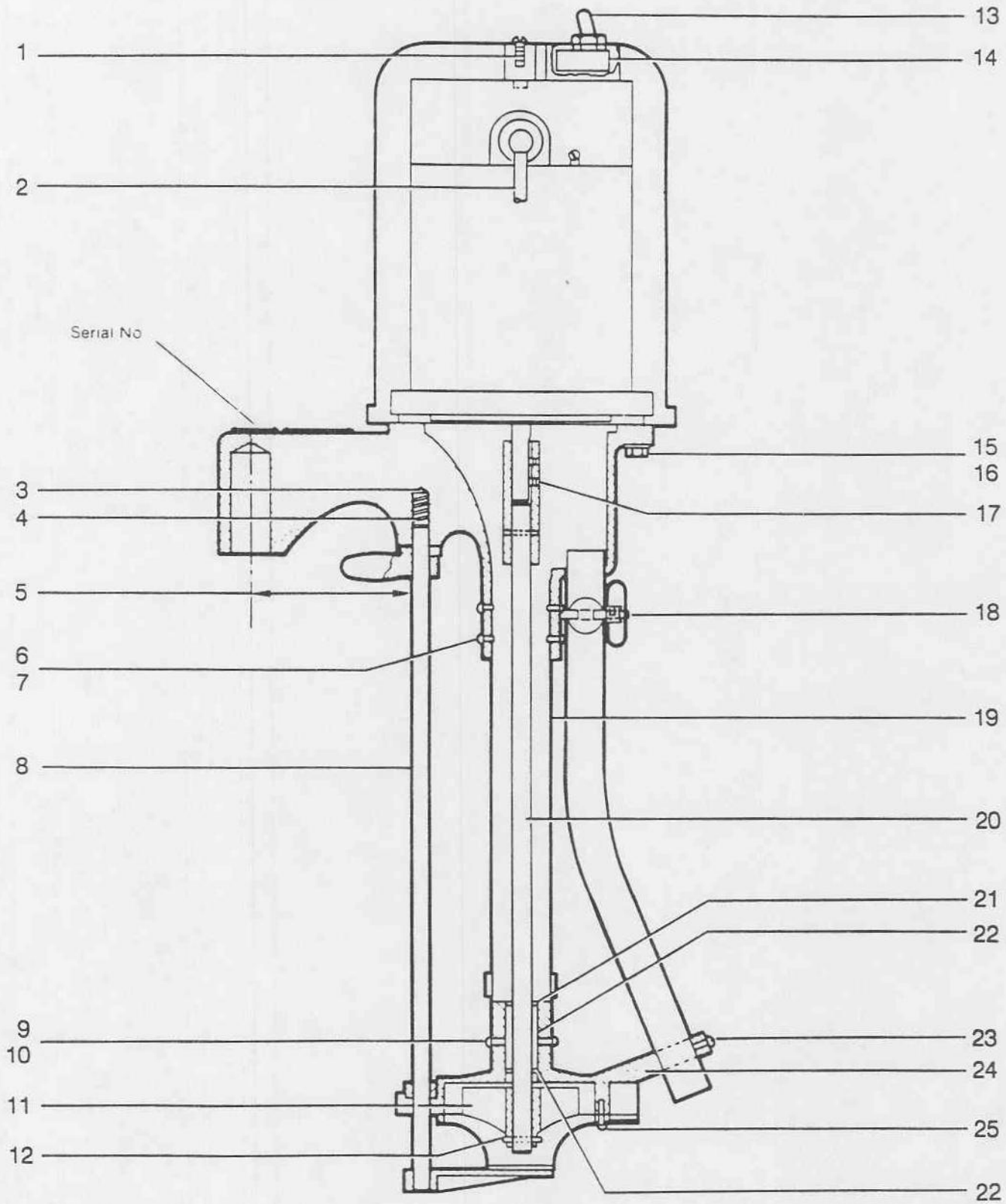
Typical current leakage of Ferno Ille mobile hydrotherapy units and components is between 40 and 70 microamperes to ground when measured per UL 544.

The current leakage test is performed by Underwriters Laboratories during investigation of a product. It is not a 100 percent production test. We are required to perform a 100 percent production dielectric strength test. A description of each test and its procedure is located in the maintenance section of this manual.

2.4 Specifications

Power supply req:	115 V AC 50/60 Hz
Maximum flow rate:	45 gal./min. (174 litres/min.)
Minimum water level:	2 in. (5 cm) above water lubricating holes.

2.5 Component Identification



Index No.	Part No.	Part Description
1	093-8089-00	Screw, nylon 1/4-20 x 1/2"
2	844-2728-00	Power cord (specify model and serial number)
3	093-8336-00	Spring slug
4	093-8376-00	Spring
5	093-8505-00	Suspension arm, painted, 4 1/8" (short)
6	093-8087-00	Screw, 8-32 x 3/8", round head
7	911-6194-00	Lockwasher, 3/8", split
8	093-9566-00	Water control rod assembly (medium)
9	093-8087-00	Screw, 8-32 x 3/8", round head
10	911-5904-00	Lockwasher, #8 shakeproof
11	093-4851-00	Impeller, 50/60 Hz units
12	093-6910-00	Cotter pin, 1/8 x 1 1/4"
13	093-8546-00	Switch cap
14	093-8556-00	Switch
15	911-5903-00	Bolt, 3/8-16 x 1 1/4", hex head
16	911-6194-00	Lockwasher, 3/8", split
17	093-8090-00	Screw, set, 10-32 x 1/4"
18	093-8877-00	Aerator tube assembly, (medium)
19	093-9156-00	Turbine tube, (medium)
20	093-8307-00	Shaft and Coupler assembly, (medium)
21	093-7996-00	Retainer ring (set of 2)
22	093-0128-00	Bearing, rubber w/ cotter pin
23	093-8088-00	Screw, 8-32 x 1/2", round head
24	093-4836-00	Turbine housing cover assembly*
25	093-8088-00	Screw, 8-32 x 1/2", round head
xx	095-0310-00	Motor, dual-voltage, 50/60 Hz
xx	095-0309-00	Motor cap, wine colored

*sold as an assembly which includes: housing, cover, guard cover, (7) screws, and (2) lockwashers.

Section 3 Equipment Operation

3.1 Unpacking the Unit

Cut the bands that secure the turbine to the top of the tank. Remove turbine from foam packaging. Cut the tape that secures the foam to the motor cap and remove the foam.

3.2 Installation

1. Mount the turbine onto the tank by placing the turbine into the tank and the turbine arm onto the elevator tube located on top of the tank control panel. The elevation tube is in the retracted position and is marked with a warning tag when shipped.

> WARNING!
>
> DO NOT LOOSEN THE FRICTION CLAMP LEVER WITHOUT THE TURBINE IN PLACE! Elevation tube is powered by a pressurized gas-cylinder. Without the load of the turbine, the elevation tube will thrust upward with significant force. FAILURE TO OBSERVE WARNING MAY RESULT IN SEVERE INJURY TO INSTALLER/ OPERATOR OR BYSTANDERS.

2. Insert the turbine's special 3-prong plug into the side of the tank's control panel. Press and twist the plug clockwise to lock it in place.

3. plug the tank's power cord into a UL approved hospital-grade outlet.

NOTE: The tank/turbine combination must be connected to the Ferno Ille electrical converter if the equipment is to be operated on 230 V AC, 50 or 60 Hz. The converter transforms the higher voltage to 115 V AC, 50 or 60 Hz, so that the tank's pump can operate properly.

> WARNING!
>
> This unit must be properly grounded to ensure safe operation. Proper grounding can only be achieved when the unit is connected to a UL approved outlet that is marked "Hospital Grade". FAILURE TO OBSERVE WARNING MAY RESULT IN SERIOUS INJURY OR DEATH TO PATIENT AND/OR PERSONNEL OPERATING THE EQUIPMENT.

3.3 Safety Precautions

It is important that all procedures in this manual be followed carefully. Failure to observe warnings and cautions may result in injury to the patient and/or the operator, and damage to the unit.

> WARNING!
>
> Hydrotherapy units are not intended to be used with electrically susceptible patients. The UL definition of an electrically susceptible patient is: " A patient being treated with an externalized electrically conductive device (for example, a probe or catheter) indwelling or implanted and terminating on or in the heart". FAILURE TO OBSERVE WARNING MAY RESULT IN POSSIBLE FATAL INJURY TO PATIENT.

3.4 Start-up Procedure

1. Fill tank with water of prescribed temperature.

> WARNING!
>
> Always verify water temperature before and during patient treatment. FAILURE TO OBSERVE WARNING MAY RESULT IN INJURY TO PATIENT.

2. Before starting turbine, adjust the turbine so that the turbine housing is submerged with at least 2 inches of water above the water lubricating holes.

> CAUTION
>
> Ensure that the water lubricating holes are clear of debris. Inspect before and after each use. If holes become clogged, surging and shortened bearing life can be expected.

3. The following turbine controls are provided to control various features of the turbine:

A. Water pressure control lever.

The water pressure control lever varies the water jet force by controlling the turbine's water intake. The lever is located directly under the suspension arm. The force of the water can be adjusted to maximum by turning the lever toward the turbine tube, to minimum flow by turning the lever toward the elevator tube, or to any flow desired by turning the lever to any position between.

B. Air volume control.

The air volume control is a butterfly valve located on the aerator tube. It controls the amount of air that is mixed with the ejected water. Additional air in the water softens the force of the water stream. Turn the butterfly valve horizontally for maximum aeration and vertically for minimum aeration.

C. Rotation and elevation.

The turbine rotates freely on the elevator tube. To raise or lower the turbine, loosen the friction clamp lever and allow the turbine to rise up or push it down to the desired elevation, tighten the friction clamp lever.

NOTE: Exert slight downward pressure on the turbine as you loosen the friction clamp lever. Failure to maintain pressure on the turbine may cause it to rise out of control.

WARNING!

Turn off the turbine before making elevation adjustments. Failure to observe this precaution may result in damage to the unit if the water lubricating holes rise above water level while the turbine is in operation.

3.5 Operation

It is not the intention of Ferno Ille to attempt to direct the clinical care of your patient, but to advise you in the proper use of Ferno Ille equipment and to maximize the quality of your clinical care.

During hydrotherapy, it is important to consider the tolerance of the patient. Patient tolerance may be based upon both physical and mental factors. Treatment therefore, should be done only under the supervision of trained medical personnel who are qualified to diagnose the patient's tolerance to hydrotherapy.

1. Pre-adjust water pressure and air volume controls to the desired settings.

2. Lower patient or patient's limb into the tank.

3. Position the turbine so that the aerator ejector opening is pointed at the area to be treated.

4. Turn on the turbine by flipping the power switch on top of the motor housing. Hydromassage patient for the prescribed length of treatment.

WARNING!

Improper use or lack of attention may allow hair, clothing, or other objects to be drawn into the turbine causing injury to the patient and/or damage to the turbine.

5. When finished treating patient, turn the turbine off. Clean and disinfect turbine and tank according to the instructions in section 4.1, entitled "Cleaning and Disinfection".

3.6 Shut-down Procedures

1. Normal shut-down: throw the switch on top of the turbine to the "OFF" position.

2. Emergency shut-down: throw the switch on top of the turbine to the "OFF" position or disconnect the turbine power cord from its power supply.

NOTE: The turbine motor is also equipped with a thermal cut-out relay which protects the motor from mechanical and thermal overloads. The relay cuts power to the motor whenever motor temperatures reach a dangerous level. When the motor cools, the relay will re-start the motor until it overheats again. This cycle will continue until the cause of the overload has been eliminated.

Section 4 Maintenance and Repair

Although every effort has been made to provide you with the safest and most reliable hydrotherapy unit, your turbine will require care and maintenance to keep it operating safely and smoothly during the many years that it will serve you.

4.1 Cleaning and Disinfection

NOTE: It is very important that these cleaning instructions be read and followed carefully. Failure to observe the following instructions will void your warranty.

The turbine and tank are constructed in part or in whole of AISI type 304 Stainless Steel for superior corrosion resistance. No metal however, is corrosion-proof. Both the tank and turbine will require thorough cleaning after each use to maintain their continued performance and polished appearance.

Each time the tank and turbine are used, a film comprised of body oils, organic material, minerals from the water, and other foreign material is deposited on the surfaces inside the tank and on the turbine. This film, if left on the equipment, will in time corrode the stainless steel, leaving pit marks in the stainless steel surfaces.

More important than cosmetic damage that these deposits can cause, are the bacteriological problems that may result from contamination of of water, equipment, and improper treatment procedures. Experience and common sense dictate that the water should be completely changed after each use. The tank and turbine should then be cleaned and sanitized with Sanizine Hard Surface Disinfectant and rinsed with hot water.

The pH of the water used in Ille tanks should be between 7.4 and 7.8 for optimum corrosion control.

> CAUTION
>
> If chlorides are used to clean the equipment, maintain the lowest possible concentration for the intended purpose. Chloride ions are a major cause of corrosion on stainless steel surfaces. Use of high concentrations of chlorides will damage the equipment and void its warranty. Chlorazene has been tested safe on stainless steel because its release rate of chlorine is much lower than that of other chlorides.

1. Routine cleaning: Use Sanizene Hard Surface Disinfectant in solution, or soap or detergent. For occasional cleaning and polishing, use Steelscrub.

2. Stubborn spots and stains: Use a good stainless steel cleanser such as Ille Steelscrub and vinegar. Scrub the area with a cloth, sponge, stainless steel wool, or a cleaning pad. Let the cleanser stand for 5 minutes, rinse with warm water, and wipe dry.

NOTE:
-Always rub in the direction the polish lines.
-Rinse thoroughly after every cleaning.
-Wipe dry to prevent water marks.
-Never use steel wool.

4.2 Scheduled Maintenance

The purchaser of Ferno Ille hydrotherapy equipment should establish an electrical safety maintenance program that is applicable to the environment in which the equipment will be used. The time between inspections will be determined by factors such as frequency of use and type of treatment.

4.2.1 Maintenance schedule

Following is a suggested minimum interval electrical safety inspection schedule.

A. Weekly:
Test GFI (ground-fault interruptor) plug. Test instructions are on the plug.

> WARNING!
>
> The maintenance information from this point forth is intended for qualified service personnel only. Ferno Ille recommends that service be refered to an authorized Ferno service facility. It is the responsibility of the organization that serices its own equipment to provide adequate training and test facilities to its maintenance personnel. Failure to understand and use proper electrical safety measures presents an electrocution hazard to personnel performing maintenance duties on the unit as well as increased possibility of injury or electrocution to patients who contact the equipment.

WARNING!

With the exception of testing the GFI plug, ALWAYS disconnect the power cord from the electrical supply before inspecting or servicing. FAILURE TO OBSERVE WARNING MAY RESULT IN INJURY TO PERSONNEL IN CONTACT WITH THE EQUIPMENT.

B. Biannually:
Perform current leakage test as described in Section 4.2.2.

C. Annually:

1. Check the rubber seal on the twist-lock plug that fits into the tank control panel. If cracks or other defects are found, the plug must be replaced. See Section 4.5 for part ordering information.

2. Power supply cord should be flexible without cracks, cuts, or abrasions of the outer insulation. If the cord is cracked or otherwise damaged, it must be replaced. See Section 4.5 for part ordering information.

3. Check your building's electrical outlets with a ground and polarity testing device (Hubbell #5200 or equiv.) to ensure that proper ground is maintained. If the outlets available are not suitable, have your electrician install a UL approved hospital-grade outlet before using the unit.

4.2.2 Current leakage and dielectric testing.

Ferno Ille recommends that a current leakage test be performed on an annual basis. This test procedure is specified by Underwriters Laboratories as an approved test method to ensure the electrical safety of hydrotherapy products. This test should be performed only by qualified personnel.

1. The current leakage test as prescribed in UL 544:

A. Cord-connected "Patient Care Equipment": All accessible parts of a cord-connected appliance are to be tested for current leakage between the parts, and between the parts and ground. When a "Patient Care" appliance is tested in the manner described below, the maximum current leakage shall not exceed 100 microamperes.

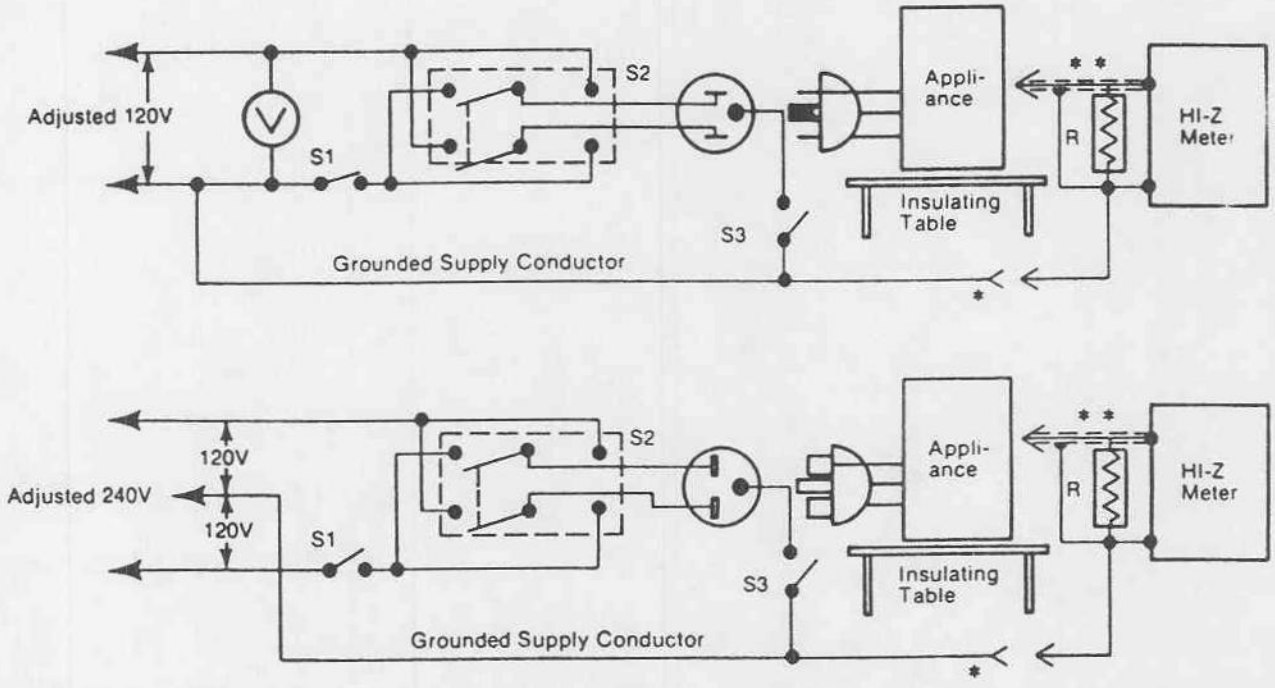
In making the leakage measurement, a single fault condition (the loss of ground in a cord-connected appliance) likely to increase the current leakage shall be introduced.

B. A sample of the appliance shall be tested for current leakage starting with the "as received" condition. The test sequence, with reference to the measurement circuit in Figure 4-1, shall be as follows:

1. With switch S1 closed to energize the appliance, current leakage shall be determined using both positions of switch S2, with the appliance switching devices in their normal operating positions, and with switch S3 in both the open and closed positions.

2. Current leakage should be monitored at sufficient intervals to determine the maximum current leakage from the time of the previous measurement to the conditions under which the normal test would be terminated. A test period of three minutes should be sufficient to detect any excessive leakage. Both positions of switch S2 shall be used in determining this measurement.

Figure 4-1 illustrates the use of the meter and switching arrangement required for measuring current leakage. Several meters capable of performing these tests are available commercially.



Notes: *Separated and used as clip when measuring voltages (currents) from one part of appliance to another. (Connected at all other times.)
**Probe with shielded lead.
R = Resistive input impedance — 1000 ohms.
HI-Z-Meter — The meter is to be average-responding and indicate RMS value of a pure sine wave within all overall measuring circuit error of not more than 5 percent at indications of 10, 50, 100 and 500 microamperes (10, 50, 100 and 500 millivolts, respectively, when using a 1000 OHM resistor) at frequencies from 10 Hz to 100 KHz.

figure 4-1

Two manufacturers of meter assemblies for testing current leakage are listed below for your convenience:

Bio-Design, Inc.
Stoughton, MA, 02072

Simpson Electric
Chicago, IL, 60644

2. Dielectric strength test description:

Some organizations require dielectric strength testing. The dielectric strength test, which is applied to every turbine at the time of manufacturing, is described as follows:

> WARNING!
>
> Dielectric strength testing requires very high voltages. **Do not attempt to test the unit if you lack the skills and/or equipment to perform this test safely.** If your training or equipment are not **adequate, have the testing performed by an authorized Ferno service facility. IMPROPER DIELECTRIC TESTING MAY DESTROY THE UNIT AND MAY RESULT IN FATAL INJURY TO THE MAINTENANCE PERSONNEL OR OTHERS IN CONTACT WITH OR NEAR THE EQUIPMENT.**

A. Insulation and spacing of an appliance shall be capable of withstanding an alternating 60Hz potential of 1,000 Volts (plus two times rated voltage) for a period of one minute when applied across current-carrying parts and accessible metal.

B. Several devices capable of performing insulation and dielectric strength testing are available commercially. Two manufacturers of devices for such testing are listed below for your convenience:

Ideal Industries, Inc.
Sycamore, IL, 60178

Slaughter Co.
Ardmore, OK, 73401

4.3 Disassembly and Internal Cleaning

1. Disconnect the power cord.

2. Ensure that the friction clamp on the elevation tube on the tank is tight. Unplug the turbine and lift it off the elevation tube and place the turbine on a suitable work surface.

> WARNING!
>
> DO NOT LOOSEN THE FRICTION CLAMP LEVER WITHOUT THE TURBINE IN PLACE! **Elevation tube is powered by a pressurized gas-cylinder. Without the load of the turbine, the elevation tube will thrust upward with significant force.** FAILURE TO OBSERVE WARNING MAY RESULT IN SEVERE INJURY TO MAINTENANCE PERSONNEL OR BYSTANDERS.

3. Remove the water pressure control rod assembly.

4. Remove the aerator tube assembly.

5. Remove the bottom impeller cover (four #8-32 screws).

6. Pull the cotter pin from the stainless steel shaft inside the bottom housing and pull the impeller off the shaft.

7. Remove motor cap assembly by taking out the nylon screw on the top of the cover and unscrewing the rubber switch cover. Pull the cover straight off.

8. Remove motor mounting bolts (four 3/8-16 hex head bolts) from the suspension bracket.

9. Pull the motor and impeller shaft from the turbine tube.

10. Remove shaft from motor by loosening the two set screws on the shaft coupler. At this time, make any necessary repairs on the motor and inspect the wiring and connections.

11. Remove the Teflon or rubber bearings from the impeller side of the housing by removing the retaining ring and then pushing the bearing out from the opposite side with the turbine shaft.. A new rubber bearing can now be inserted. Sprinkle a small amount of talc on the rubber bearing and press it into place. Place the the retaining ring back in its original position.

12. All parts can now be inspected and/or repaired.. Refer to Section 4.5 for replacement parts information.

13. To reassemble, reverse the above steps.

NOTE: When remounting the motor and shaft assembly, it may be necessary to make a shaft length adjustment. See instructions below for completing this procedure.

1. Push the shaft coupler as far as it will go onto the motor shaft. Tighten the set screws just tight enough to keep the shaft from moving on its own but not so tight that they prevent movement of the shaft with hand pressure.

2. Place the motor/shaft assembly into the turbine tube. Tighten two of the four motor mounting bolts. Leave the other two bolts out. Place the impeller onto the shaft and align the cotter pin holes. Insert a cotter pin but do not bend it.

3. Push or pull the impeller until there is a 3/32" clearance between the flat side of the impeller and the impeller housing.

4. Carefully remove cotter pin and pull off impeller. Do not move shaft.

5. Remove motor mounting bolts and pull the motor and shaft from the turbine tube. Without moving the shaft, tighten the set screws on the shaft coupler. Remount the motor, place the impeller on the shaft and secure it with a cotter pin. Re-install the impeller housing cover.

6. Spin the impeller to make certain that it does not rub on either side of the impeller housing. The impeller can be reached through the water exhaust port on the side of the turbine housing.

4.4 Troubleshooting

4.4.1 Turbine Stops While in Use

Symptom: If the motor stops, or stops and then starts again after a short time, and the motor cover is hot, then the thermal overload cut-out relay has most likely interrupted power to the motor.

Corrective action: Flip the power switch on top of the turbine to "OFF". Unplug the turbine and remove it from the tank. Follow proper removal procedure to prevent injury (see section 4.3). Remove the impeller housing screws and cover. Clean out any foreign matter that is causing an overload.

After removing the material, spin the impeller to insure that it turns freely. If it does not, replacement of the impeller bearing and in some cases replacement of the shaft assembly may be necessary. These parts will wear in time with hard use. Running the turbine dry or with the water lubricating holes blocked will accelerate wear.

4.4.2 Turbine Will Not Start

Corrective action: Check the power source to make certain that a blown fuse or tripped circuit breaker has not interrupted the power supply.

Check turbine power plug to make certain it is properly seated in its socket on the tank.

Check GFI on tank for a trip indication. Reset after determining and correcting cause of overload.

4.5 Parts

This section contains a complete list of all replaceable parts of the Ferno Ille turbine model 100. For the purpose of part identification, the unit is broken down into functional assemblies, and each assembly is shown in a photograph with call-outs which are keyed to the accompanying parts list. Each parts list contains the figure index number, Ferno Ille part number, and an abbreviated description.

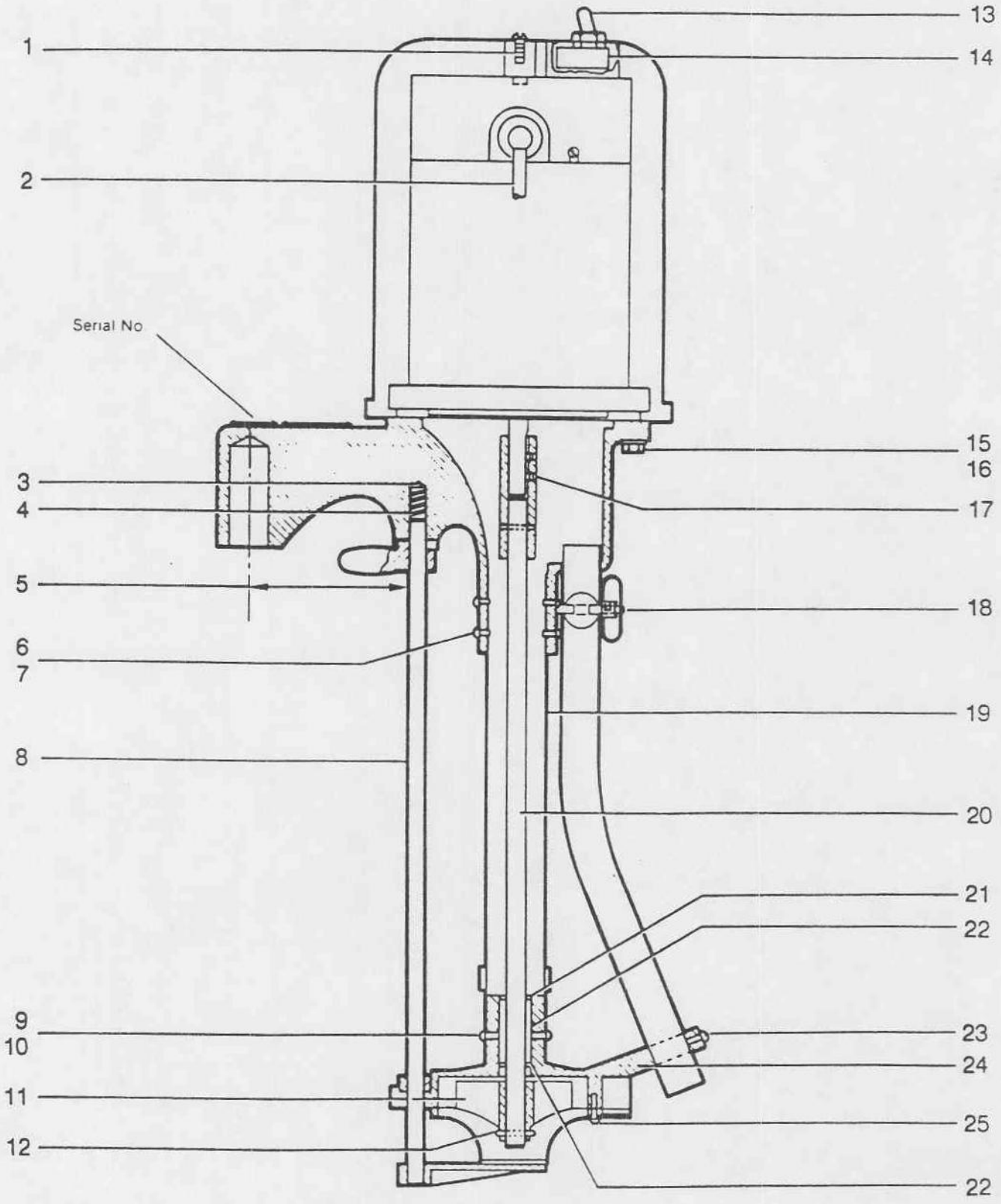
4.5.1 Ordering Information

Orders for repair parts should be directed to the nearest authorized parts distributor. For the current Ferno Ille authorized parts distributor in your area contact:

Ferno Ille Customer Service
70 Weil Way
Wilmington, OH 45177-9371

Phone: (513) 382-1451
(800) 73 FERNO
FAX (513) 382-1191

4.5.2 Parts List



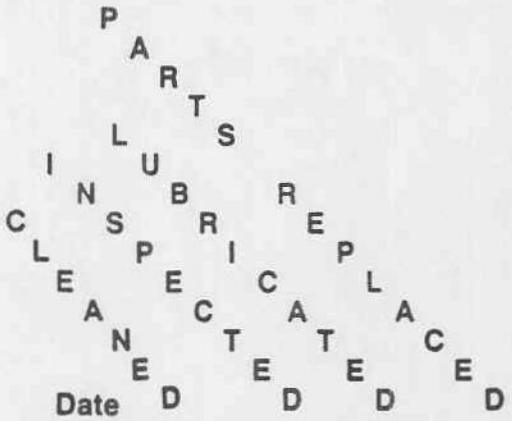
Index No.	Part No.	Part Description
1	093-8089-00	Screw, nylon 1/4-20 x 1/2"
2	844-2728-00	Power cord (specify model and serial number)
3	093-8336-00	Spring slug
4	093-8376-00	Spring
5	093-8505-00	Suspension arm, painted, 4 1/8" (short)
6	093-8087-00	Screw, 8-32 x 3/8", round head
7	911-6194-00	Lockwasher, 3/8", split
8	093-9566-00	Water control rod assembly (medium)
9	093-8087-00	Screw, 8-32 x 3/8", round head
10	911-5904-00	Lockwasher, #8 shakeproof
11	093-4851-00	Impeller, 50/60 Hz units
12	093-6910-00	Cotter pin, 1/8 x 1 1/4"
13	093-8546-00	Switch cap
14	093-8556-00	Switch
15	911-5903-00	Bolt, 3/8-16 x 1 1/4", hex head
16	911-6194-00	Lockwasher, 3/8", split
17	093-8090-00	Screw, set, 10-32 x 1/4"
18	093-8877-00	Aerator tube assembly, (medium)
19	093-9156-00	Turbine tube, (medium)
20	093-8307-00	Shaft and Coupler assembly, (medium)
21	093-7996-00	Retainer ring (set of 2)
22	093-0128-00	Bearing, rubber w/ cotter pin
23	093-8088-00	Screw, 8-32 x 1/2", round head
24	093-4836-00	Turbine housing cover assembly*
25	093-8088-00	Screw, 8-32 x 1/2", round head
xx	095-0310-00	Motor, dual-voltage, 50/60 Hz
xx	095-0309-00	Motor cap, wine colored

*sold as an assembly which includes: housing, cover, guard cover, (7) screws, and (2) lockwashers.

Product Name _____ Model _____ Serial No. _____

Date Purchased _____ Purchased From _____

Date Placed In Service _____



Date					Comments/Problems/Disposition	Initials

Section 5 Limited Warranty

Ferno Ille warrants this turbine to the original purchaser to be free from defects, other than from misuse, abuse, neglect, accident, alteration, unauthorized service, or improper installation; and will repair or replace it, at its option, without cost to purchaser for a period of one year from the date of purchase; and makes no other warranty of any kind, expressed or implied, and the implied warranties of merchantability and fitness for a particular purpose and are hereby disclaimed and excluded.

The terms of this limited warranty are effective only after the enclosed warranty registration card is completed and returned to Ferno Ille.

MODEL 290
BATH, WHIRLPOOL, MOBILE

OPERATION/MAINTENANCE MANUAL

Section 1 Table of Contents.

Section	2	Introduction.	2-1
	2.1	Preface.	2-1
	2.2	Proprietary Notice.	2-1
	2.3	Model 290 Information.	2-1
	2.4	Specifications.	2-1
	2.4.1	Tank Specifications.	2-1
	2.4.2	GFI Specifications.	2-1
	2.5	Component Identification.	2-2
Section	3	Equipment Operation.	3-1
	3.1	Unpacking the Tank.	3-1
	3.2	Installation.	3-1
	3.2.1	Tank Preparation.	3-1
	3.2.2	Electrical Preparation.	3-1
	3.2.3	Heater Preparation.	3-1
	3.2.4	Heater Adjustment.	3-2
	3.3	Safety Precautions	3-2
	3.4	Start-up Procedure.	3-2
	3.5	Operation.	3-3
	3.6	Shut-down Procedures.	3-3
Section	4	Maintenance and Repair.	4-1
	4.1	Cleaning and Disinfection.	4-1
	4.2	Scheduled Maintenance.	4-1
	4.2.1	Maintenance Schedule.	4-1
	4.2.2	Current Leakage and Dielectric Testing.	4-3
	4.3	Repair Procedures.	4-4
	4.3.1	Clearing Obstructions from the Drain Pump.	4-4
	4.3.2	Removal and Replacement of the Drain Pump Impeller.	4-5
	4.4	Parts.	4-5
	4.4.1	Parts Ordering Information.	4-5
	4.4.2	Parts List.	4-6
	4.5	Maintenance Log.	4-8
Section	5	Limited Warranty.	5-1

Section 2 Introduction

2.1 Preface

This manual contains operation, maintenance, and service information for the Ferno Ille Model 290 Hydrotherapy Tank.

The drawings of sub-assemblies are aids to the identification, disassembly, and assembly of the tank. Each parts list provides the necessary information to order replacement parts, parts assemblies, or kits.

NOTE: It is the user's responsibility to coordinate the power and plumbing requirements for installation with the contractor, maintenance, or engineering department for product installation where applicable.

2.2 Proprietary Notice

The information and design disclosed herein were originated by and are the property of Ferno Ille, a division of Ferno Washington, Inc.. Ferno Ille and Ferno Washington, Inc. reserve all patents, proprietary design, manufacturing, reproduction use, and sales rights thereto and to any articles disclosed therein, except to the extent that rights are expressly granted to others. The foregoing does not apply to vendor proprietary parts.

Specifications remain subject to change to allow the introduction of design improvements.

2.3 Model 290 Information.

NOTE: Ferno Ille tanks are Underwriters Laboratories listed. Accordingly, they will conform to the UL "Standards for Safety-Medical and Dental Equipment" (UL 544 - October 24, 1986) and are classified as "Patient Care Equipment."

"Patient Care Equipment" is defined as: "Equipment that is intended to be used on or with, or likely to be contacted by a patient in a health care facility in the course of his treatment."

Grounded patient care equipment is permitted to have a maximum current leakage of 100 microamperes to ground.

Typical current leakage of Ferno Ille mobile hydrotherapy units and components is between 40 and 70 microamperes to ground when measured per UL 544.

The current leakage test is performed by Underwriters Laboratories during investigation of a product. It is not a 100 percent production test. We are required to perform a 100 percent production dielectric strength test. A description of each test and its procedure is located in the maintenance section of this manual.

2.4 Specifications

2.4.1 Tank Specifications

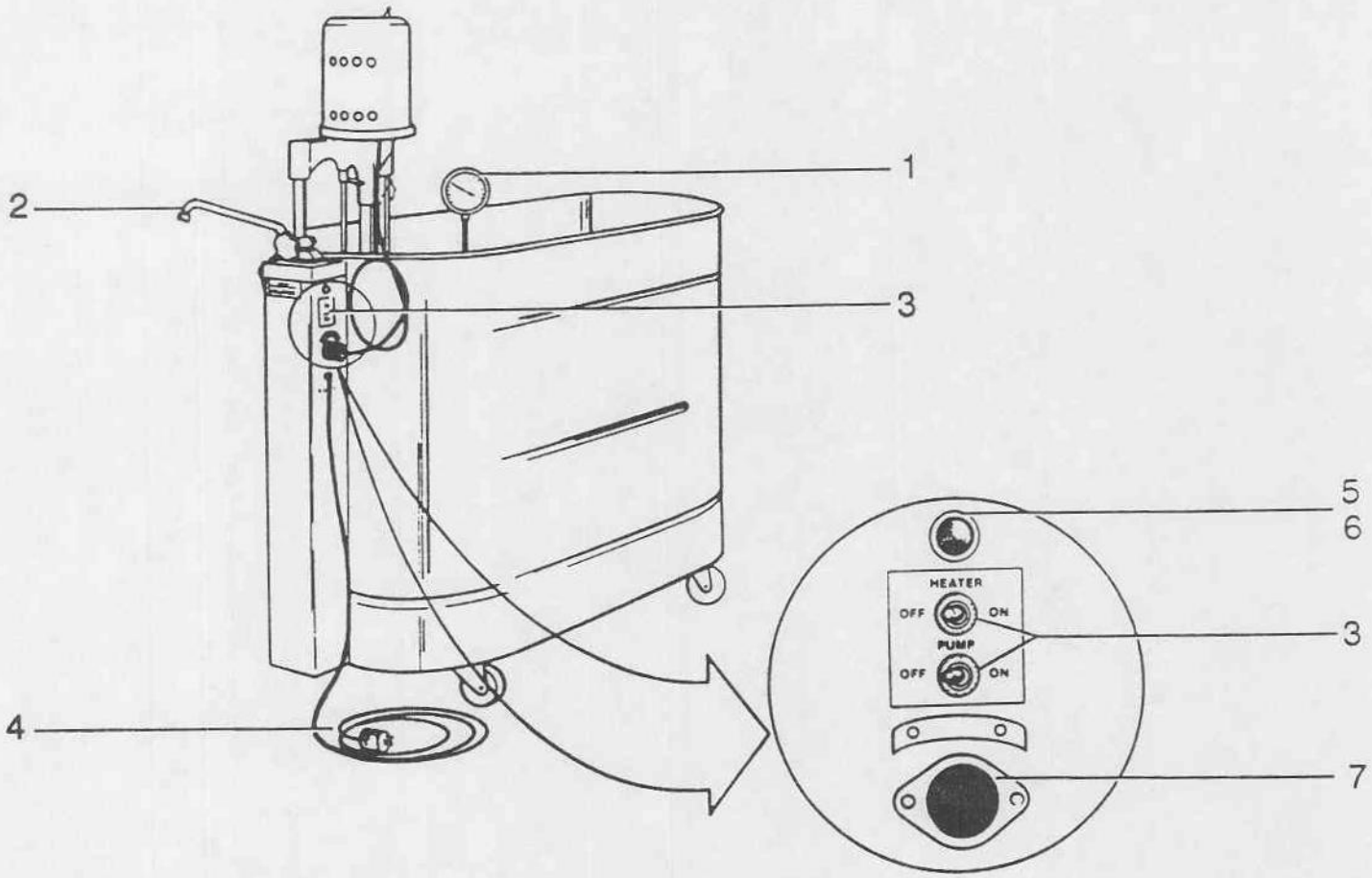
Length:	60 in. (152 cm).
Width:	25 in. (64 cm).
Depth:	18 in. (46 cm).
Height:	27 in. (69 cm).
Capacity:	93 gal. (352 litres)
Power req.:	115 V AC 50/60 Hz 230 V AC 50/60 Hz.

NOTE: Electrical converter required for tank to operate in 230 V environment.

2.4.2 GFI Specifications

Supply Voltage:	120 (+10,-15) V AC, 60 Hz, 15 A.
Temp. range:	-30°F (-35°C) to 150°F (66°C).
Trip Threshold:	5 +/- 1 mA
Trip Time:	0.025 sec. nom.

2.5 Component Identification.



Index No.	Part No.	Part Description	No. Req'd
1	093-8716-00	18" Thermometer kit (includes bracket)	1
2	093-1079-00	Drain swing arm	1
3	093-8558-00	Switch, heater/water pump	1
4	093-0601-00	Cord assembly (w/o GFI)	1
5	093-6818-00	Pilot light, red	1
6	093-8559-00	Pilot light cover, red	1
7	093-7851-00	Twist-lock receptacle, hollow pin	1

Section 3 Equipment Operation

3.1 Unpacking the Unit

Remove tank shipping carton from the wooden base. Carefully cut the bands and remove the inner packaging. Remove the turbine and tank accessories from the tank and set them aside.

3.2 Installation

3.2.1 Tank Preparation

Mount the turbine onto the tank by placing the turbine into the tank and the turbine arm onto the elevator tube located on top of the tank control panel. The elevation tube is in the retracted position and is marked with a warning tag when shipped. Remove the tag after reading it.

> WARNING!
>
> **DO NOT LOOSEN THE FRICTION CLAMP LEVER WITHOUT THE TURBINE IN PLACE! Elevation tube is powered by a pressurized gas-cylinder. Without the load of the turbine, the elevation tube will thrust upward with significant force. FAILURE TO OBSERVE WARNING MAY RESULT IN SEVERE INJURY TO INSTALLER/ OPERATOR OR BYSTANDERS.**

A dial thermometer for reading water temperature is mounted onto the inner wall of the unit. The thermometer may be rotated for better viewing by loosening the thumbscrew and adjusting the thermometer. Tighten the thumb screw to prevent rattling during tank use.

> CAUTION
>
> Do not allow the thermometer to contact water over 160°F (71°C). The thermometer may be damaged if left in the tank during cleaning when hot water is used.

3.2.2 Electrical Preparation

1. Insert the turbine's special 3-prong plug into

the side of the tank's control panel. Press and twist the plug clockwise to lock it in place.
2. plug the tank's GFI power cord into a UL approved hospital-grade outlet.

NOTE: The tank/turbine combination must be connected to the Ferno Ille electrical converter if the equipment is to be operated on 230 V AC, 50 or 60 Hz. The converter transforms the higher voltage to 115 V AC, 50 or 60 Hz, so that the tank's pump can operate properly.

> WARNING!
>
> **This unit must be properly grounded to ensure safe operation. Proper grounding can only be achieved when the unit is connected to a UL approved outlet that is marked "Hospital Grade". FAILURE TO OBSERVE WARNING MAY RESULT IN SERIOUS INJURY OR DEATH TO PATIENT AND/OR PERSONNEL OPERATING THE EQUIPMENT.**

3.2.3 Heater Preparation

The tank is equipped with a heater to maintain the temperature of the water in the tank.

NOTE: The tank heater is intended for use as a temperature maintenance heater only. It is not designed nor able to raise the temperature of cold water to treatment temperature.

The heater is thermostatically controlled. The thermostat is factory set at 105°F (40°C). The thermostat can be adjusted to suit field conditions or individual needs.

> CAUTION
>
> The heater is not designed to be left turned on without water in the tank. Although the thermostat will limit overheating, shortened component life will result if the heater is left on.

A red pilot light located on the tank control panel above the heater switch indicates heater operation.

A heater guard is included with your tank. It prevents the patient's feet from contacting the warm tank bottom.

The heater guard sits in the bottom of the tank and indexes on the thermometer and an index pin, see figure 3-1.

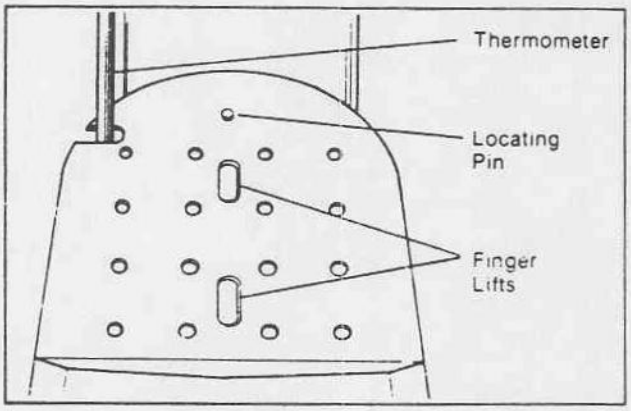


figure 3-1

3.2.4 Heater Adjustment

Fill the tank and turn the heater on. Allow the heater to operate for at least an hour before attempting adjustments. The thermostat adjustment knob is located at the control panel end, underneath the tank, see figure 3-2.

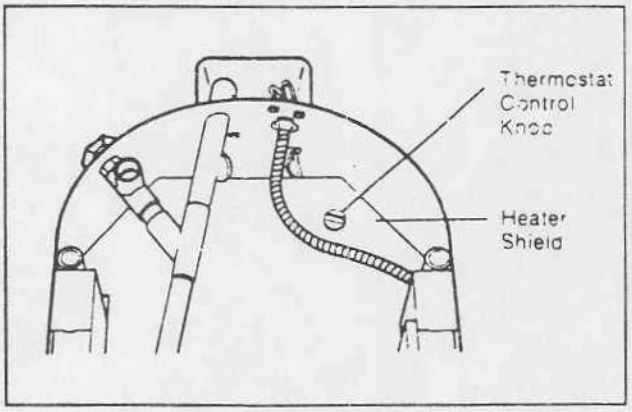


figure 3-2

Reach underneath the tank and grasp the plastic knob. Rotate the knob clockwise to lower the temperature or counterclockwise to raise the temperature. Only slight movement is required.

Allow one hour before reading the thermometer. If further adjustments are needed, repeat the above steps.

NOTE: The 105°F (40°C) setting is midway between the high and low stops.

3.3 Safety Precautions

It is important that all procedures in this manual be followed carefully. Failure to observe warnings and cautions may result in injury to the patient and/or the operator, and damage to the unit.

> WARNING!
>
> Hydrotherapy units are not intended to be used with electrically susceptible patients. The UL definition of an electrically susceptible patient is: " A patient being treated with an externalized electrically conductive device (for example, a probe or catheter) indwelling or implanted and terminating on or in the heart". FAILURE TO OBSERVE WARNING MAY RESULT IN POSSIBLE FATAL INJURY TO PATIENT.

3.4 Start-up Procedure

1. A filler hose is provided to fill tank. Roll the tank to the water source. Connect the hose to the water source and fill the tank to 5 inches from the top of the tank with water of prescribed temperature.

> WARNING!
>
> Always verify water temperature before and during patient treatment. FAILURE TO OBSERVE WARNING MAY RESULT IN INJURY TO PATIENT.

2. Before starting turbine, adjust the turbine so that the turbine housing is submerged with at least 2 inches of water above the water lubricating holes.

> CAUTION
>
> Ensure that the water lubricating holes are clear of debris. Inspect before and after each use. If holes become clogged, surging and shortened turbine bearing life can be expected.

Refer to turbine operating instructions for a description of turbine controls.

Turbine rotation and elevation is controlled on the tank. The turbine rotates freely on the elevator tube. To raise or lower the turbine, loosen the friction clamp lever and allow the turbine to rise up or push it down to the desired elevation, tighten the friction clamp lever.

NOTE: Exert slight downward pressure on the turbine as you loosen the friction clamp lever. Failure to maintain pressure on the turbine may cause it to rise out of control.

WARNING!

Turn off the turbine before making elevation adjustments. Failure to observe this precaution may result in damage to the unit if the water lubricating holes rise above water level while the turbine is in operation.

3.5 Operation

It is not the intention of Ferno Ille to attempt to direct the clinical care of your patient, but to advise you in the proper use of Ferno Ille equipment and to maximize the quality of your clinical care.

During hydrotherapy, it is important to consider the tolerance of the patient. Patient tolerance may be based upon both physical and mental factors. Treatment therefore, should be done only under the supervision of trained medical personnel who are qualified to diagnose the patient's tolerance to hydrotherapy.

Follow the turbine start-up instructions for use of the turbine during treatment.

3.6 Shut-down Procedures

When finished treating the patient, turn the turbine and heater off.

Drain the unit by rolling the tank to a tub and move the drain swing arm over the tub. Remove any debris such as bandages or gauze from the water. These objects could become lodged in the drain pump if not removed.

Flip the switch marked "Pump" and the electric drain pump will begin draining the tank. There is also a drain valve under the bottom of the tank which facilitate complete draining of any residual water in the tank. This drain must be used over a floor drain.

CAUTION

Do not allow the drain pump to run dry. Operating the pump without water will cause damage and void the warranty on the pump.

NOTE: The tank drain motor is also equipped with a thermal cut-out relay which protects the motor from mechanical and thermal overloads. The relay cuts power to the motor whenever motor temperature reaches a dangerous level. When the motor cools, the relay will re-start the motor until it overheats again. This cycle will continue until the cause of the overload has been eliminated.

Clean and disinfect tank and turbine according to the instructions in section 4.1, entitled "Cleaning and Disinfection".

Section 4 Maintenance and Repair

Although every effort has been made to provide you with the safest and most reliable hydrotherapy unit, your tank will require care and maintenance to keep it operating safely and smoothly during the many years that it will serve you.

4.1 Cleaning and Disinfection

NOTE: It is very important that these cleaning instructions be read and followed carefully. Failure to observe the following instructions will void your warranty.

The turbine and tank are constructed in part or in whole of AISI type 304 Stainless Steel for superior corrosion resistance. No metal however, is corrosion-proof. Both the tank and turbine will require thorough cleaning after each use to maintain their continued performance and polished appearance.

Each time the tank and turbine are used, a film comprised of body oils, organic material, minerals from the water, and other foreign material is deposited on the surfaces inside the tank and on the turbine. This film, if left on the equipment, will in time corrode the stainless steel, leaving pit marks in the stainless steel surfaces.

More important than cosmetic damage that these deposits can cause, are the bacteriological problems that may result from contamination of of water, equipment, and improper treatment procedures. Experience and common sense dictate that the water should be completely changed after each use. The tank and turbine should then be cleaned and sanitized with Sanizine Hard Surface Disinfectant and rinsed with hot water.

The pH of the water should be between 7.4 and 7.8 for optimum corrosion control.

> CAUTION
>
> If chlorides are used to clean the equipment, maintain the lowest possible concentration for the intended purpose. Chloride ions are a major cause of corrosion on stainless steel surfaces. Use of high concentrations of chlorides will damage the equipment and void its warranty. Chlorazene has been tested safe on stainless steel because its release rate of chlorine is much lower than that of other chlorides.

1. Routine cleaning: Use Sanizene Hard Surface Disinfectant in solution, or soap or detergent. For occasional cleaning and polishing, use Steelscrub.

2. Stubborn spots and stains: Use a good stainless steel cleanser such as Ille Steelscrub and vinegar. Scrub the area with a cloth, sponge, stainless steel wool, or a cleaning pad. Let the cleanser stand for 5 minutes, rinse with warm water, and wipe dry.

NOTE:
-Always rub in the same direction as the polish lines.
-Rinse thoroughly after every cleaning operation.
-Wipe dry to prevent water marks.
-Never use steel wool.

4.2 Scheduled Maintenance

The purchaser of Ferno Ille hydrotherapy equipment should establish an electrical safety maintenance program that is applicable to the environment in which the equipment will be used. The time between inspections will be determined by factors such as frequency of use and type of treatment.

4.2.1 Maintenance schedule

Following is a suggested minimum interval electrical safety inspection schedule.

A. Weekly:
Test GFI (ground-fault interruptor) plug. Test instructions are on the plug.

> WARNING!
>
> The maintenance information from this point forth is intended for qualified service personnel only. Ferno Ille recommends that service be referred to an authorized Ferno service facility. It is the responsibility of the organization that services its own equipment to provide adequate training and test facilities to its maintenance personnel. Failure to understand and use proper electrical safety measures presents an electrocution hazard to personnel performing maintenance duties on the unit as well as increased possibility of injury or electrocution to patients who contact the equipment.

WARNING!

With the exception of testing the GFI plug, ALWAYS disconnect the power cord from the electrical supply before inspecting or servicing. FAILURE TO OBSERVE WARNING MAY RESULT IN INJURY TO PERSONNEL IN CONTACT WITH THE EQUIPMENT.

B. Biannually: Perform current leakage test as described in Section 4.2.2.

C. Annually:

1. Check the rubber seal on the twist-lock plug that fits into the tank control panel. If cracks or other defects are found, the plug must be replaced. See Section 4.4 for part ordering information.

2. Power supply cord should be flexible without cracks, cuts, or abrasions of the outer insulation. If the cord is cracked or otherwise damaged, it must be replaced. See Section 4.4 for part ordering information.

3. Check your building's electrical outlets with a ground and polarity testing device (Hubbell #5200 or equiv.) to ensure that proper ground is maintained. If the outlets available are not suitable, have your electrician install a UL approved hospital-grade outlet before using the unit.

4.2.2 Current leakage and dielectric testing.

Ferno Ille recommends that a current leakage test be performed on an annual basis. This test procedure is specified by Underwriters Laboratories as an approved test method to ensure the electrical safety of hydrotherapy products. This test should be performed only by qualified personnel.

1. The current leakage test as prescribed in UL 544:

A. Cord-connected "Patient Care Equipment": All accessible parts of a cord-connected appliance are to be tested for current leakage between the parts, and between the parts and ground. When a "Patient Care" appliance is tested in the manner described below, the maximum current leakage shall not exceed 100 microamperes.

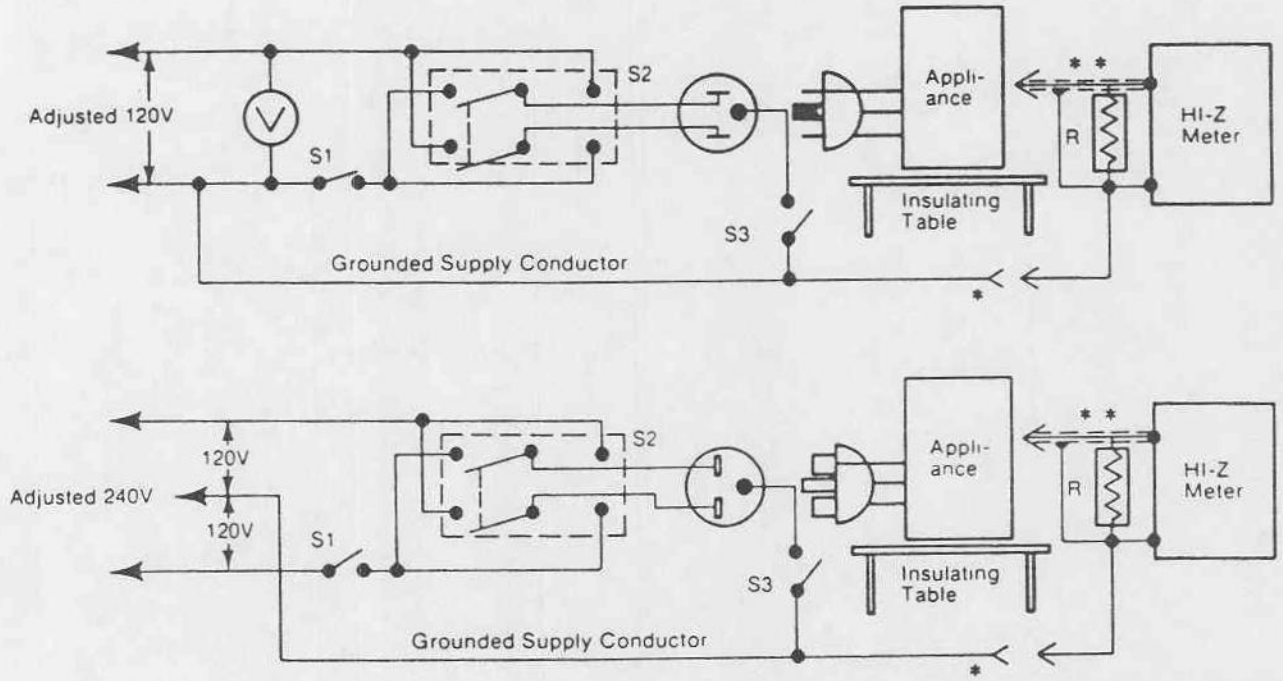
In making the leakage measurement, a single fault condition (the loss of ground in a cord-connected appliance) likely to increase the current leakage shall be introduced.

B. A sample of the appliance shall be tested for current leakage starting with the "as received" condition. The test sequence, with reference to the measurement circuit in Figure 4-1, shall be as follows:

1. With switch S1 closed to energize the appliance, current leakage shall be determined using both positions of switch S2, with the appliance switching devices in their normal operating positions, and with switch S3 in both the open and closed positions.

2. Current leakage should be monitored at sufficient intervals to determine the maximum current leakage from the time of the previous measurement to the conditions under which the normal test would be terminated. A test period of three minutes should be sufficient to detect any excessive leakage. Both positions of switch S2 shall be used in determining this measurement.

Figure 4-1 illustrates the use of the meter and switching arrangement required for measuring current leakage.



Notes: *Separated and used as clip when measuring voltages (currents) from one part of appliance to another. (Connected at all other times.)

**Probe with shielded lead.

R = Resistive input impedance — 1000 ohms.

HI-Z-Meter — The meter is to be average-responding and indicate RMS value of a pure sine wave within all overall measuring circuit error of not more than 5 percent at indications of 10, 50, 100 and 500 microamperes (10, 50, 100 and 500 millivolts, respectively, when using a 1000 OHM resistor) at frequencies from 10 Hz to 100 KHz.

figure 4-1

Several meters capable of performing these tests are available commercially. Two manufacturers of meter assemblies for testing current leakage are listed below for your convenience:

Bio-Design, Inc.
Stoughton, MA, 02072

Simpson Electric
Chicago, IL, 60644

2. Dielectric strength test description:

Some organizations require periodic dielectric strength testing. The dielectric strength test, which is applied to every turbine at the time of manufacturing, is described as follows:

> WARNING!
>
> Dielectric strength testing requires very high voltages. Do not attempt to test the unit if you lack the skills and/or equipment to perform this test safely. If your training or equipment are not adequate, have the testing performed by an authorized Ferno service facility. IMPROPER DIELECTRIC TESTING MAY DESTROY THE UNIT AND MAY RESULT IN FATAL INJURY TO THE MAINTENANCE PERSONNEL OR OTHERS IN CONTACT WITH OR NEAR THE EQUIPMENT.

A. Insulation and spacing of an appliance shall be capable of withstanding an alternating 60Hz potential of 1,000 Volts (plus two times rated voltage) for a period of one minute when applied across current-carrying parts and accessible metal.

B. Several devices capable of performing insulation and dielectric strength testing are available commercially. Two manufacturers of devices for such testing are listed below for your convenience:

Ideal Industries, Inc.
Sycamore, IL, 60178

Slaughter Co.
Ardmore, OK, 73401

4.3 Repair Procedures

4.3.1 Clearing Obstructions from the Drain Pump

If fails to flow or flows slowly from the drain swing arm, it is usually a result of an obstruction in the pump or in the discharge plumbing.

1. Be certain that the pump is turned on. If not, proceed to the next step.

2. Probe into the drain arm opening with a piece of wire. If the swing arm was clogged you will probably find the obstruction here. If no object is found here, the obstruction is in another part of the system. Go to step 3.

3. Ensure that the friction clamp on the elevation tube on the tank is tight. Unplug the turbine from the tank and lift it off the elevation tube and place the turbine in a safe place.

> WARNING!
>
> DO NOT LOOSEN THE FRICTION CLAMP LEVER WITHOUT THE TURBINE IN PLACE! Elevation tube is powered by a pressurized gas-cylinder. Without the load of the turbine, the elevation tube will thrust upward with significant force. FAILURE TO OBSERVE WARNING MAY RESULT IN SEVERE INJURY TO MAINTENANCE PERSONNEL OR BYSTANDERS.

Attach filler hose to the drain swing arm and hook the other end to a water supply. Backwash the system and remove and debris that is washed out.

> CAUTION
>
> Be aware that there may be a considerable amount of water on the floor after backwashing. If possible, take the unit to a well drained area before attempting this step.

If backwashing does not succeed, proceed to section 4.3.2.

4.3.2 Removal and Replacement of the Drain Pump Impeller

1. Disconnect power supply cord before servicing.

2. Loosen and slip back the two hose clamps that attach the hoses to the pump.

3. Remove the four pump mounting screws.

4. Slip out the copper drain tubing assembly.

5. Slide pump off cast elbow spud housing.

6. Remove the four pump housing screws and lift housing off. Remove any foreign matter present.

7. If the impeller requires replacement, simply unscrew it counterclockwise. It may be necessary to brace the shaft to allow the impeller to come loose. Spin the impeller off. See parts section for replacement parts ordering information.

8. Reverse the above steps for reassembly.

NOTE: Replacement seals are available if needed. Running the pump dry may ruin the seal. To replace, remove the impeller per the above instructions and replace the seal. See parts section for replacement parts ordering information.

4.4 Parts

This section contains a complete list of all replaceable parts of the Ferno Ille tank model 200. For the purpose of part identification, the unit is broken down into functional assemblies, and each assembly is shown in a photograph with call-outs which are keyed to the accompanying parts list. Each parts list contains the figure index number, Ferno Ille part number, and an abbreviated description.

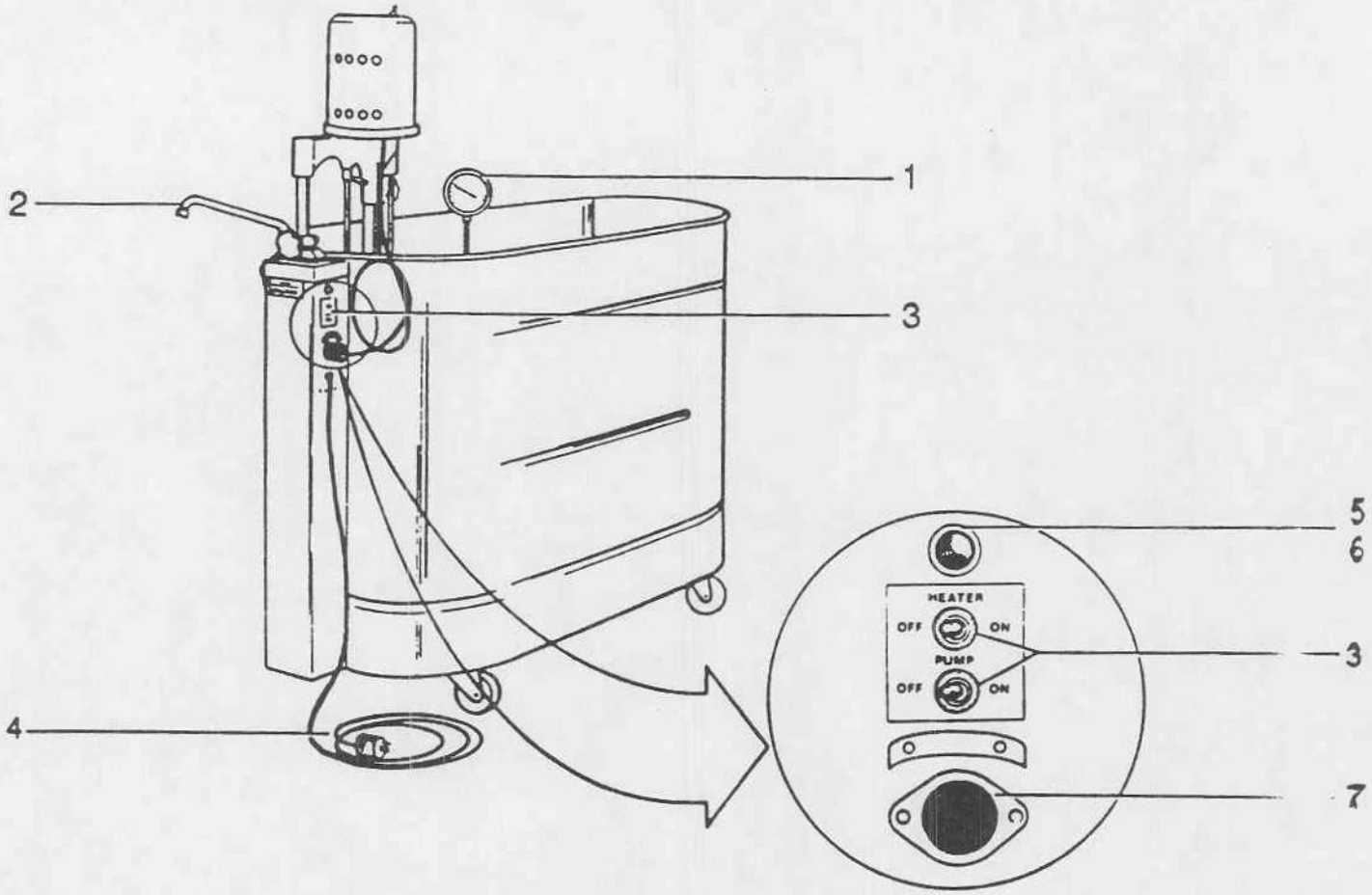
4.4.1 Ordering Information

Orders for repair parts should be directed to the nearest authorized parts distributor. For the current Ferno Ille authorized parts distributor in your area contact:

Ferno Ille Customer Service
70 Weil Way
Wilmington, OH 45177-9371

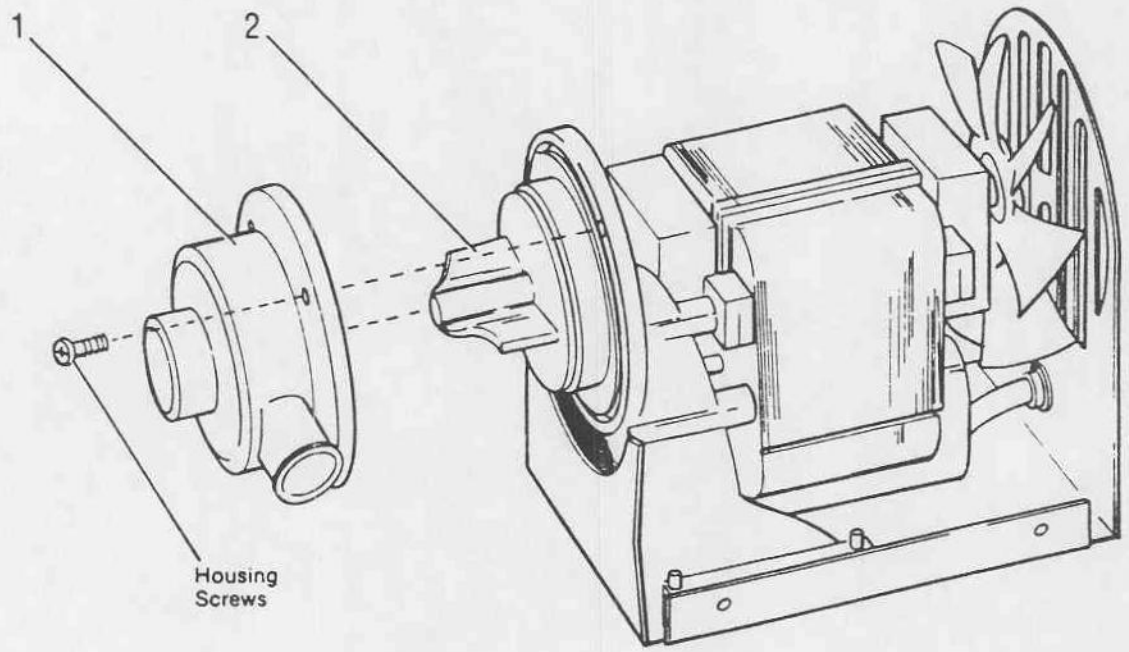
Phone: (513) 382-1451
(800) 73 FERNO
FAX (513) 382-1191

4.4.2 Parts List



Index No.	Part No.	Part Description	No. Req'd
1	093-8716-00	18" Thermometer kit (includes bracket)	1
2	093-1079-00	Drain swing arm	1
3	093-8558-00	Switch, heater/water pump	1
4	093-0601-00	Cord assembly (w/o GFI)	1
5	093-6818-00	Pilot light, red	1
6	093-8559-00	Pilot light cover, red	1
7	093-7851-00	Twist-lock receptacle, hollow pin	1

Pump and Components

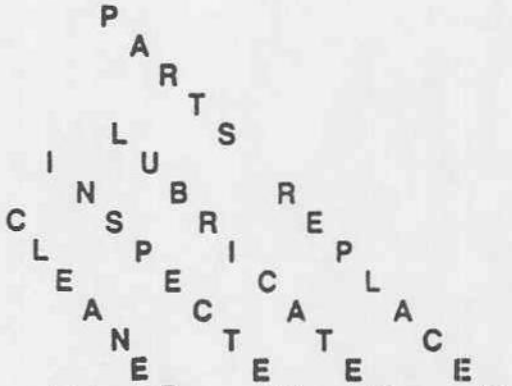


Index No.	Part No.	Part Description	No. Req'd
1	093-4839-00	Housing, pump	1
2	093-4859-00	Impeller/seal replacement kit	1
3	095-0260-00	Complete pump assembly, 115V 50/60 Hz	1

Product Name _____ Model _____ Serial No. _____

Date Purchased _____ Purchased From _____

Date Placed In Service _____



Date					Comments/Problems/Disposition	Initials

Section 5 Limited Warranty

Ferno Ille warrants this turbine to the original purchaser to be free from defects, other than from misuse, abuse, neglect, accident, alteration, unauthorized service, or improper installation; and will repair or replace it, at its option, without cost to purchaser for a period of one year from the date of purchase; and makes no other warranty of any kind, expressed or implied, and the implied warranties of merchantability and fitness for a particular purpose and are hereby disclaimed and excluded.

The terms of this limited warranty are effective only after the enclosed warranty registration card is completed and returned to Ferno Ille.

CONVERTER, ELECTRICAL

OPERATION/MAINTENANCE MANUAL

Section 2 Introduction

2.1 Preface

This manual contains operation, maintenance, and service information for the Ferno Ille Electrical Converter.

The drawings of sub-assemblies are aids to the identification, disassembly, and assembly of the tank. Each parts list provides the necessary information to order replacement parts, parts assemblies, or kits.

NOTE: It is the user's responsibility to coordinate the power and plumbing requirements for installation with the contractor, maintenance, or engineering department for product installation where applicable.

2.2 Proprietary Notice

The information and design disclosed herein were originated by and are the property of Ferno Ille, a division of Ferno Washington, Inc.. Ferno Ille and Ferno Washington, Inc. reserve all patents, proprietary design, manufacturing, reproduction use, and sales rights thereto and to any articles disclosed therein, except to the extent that rights are expressly granted to others. The foregoing does not apply to vendor proprietary parts.

Specifications remain subject to change to allow the introduction of design improvements.

2.3 Electrical Converter Information.

The Ferno Ille Electrical Converter is used to convert 230 V AC supply power to the 115 V AC required by the Ferno Ille Model 200 tank.

NOTE: Ferno Ille hydrotherapy equipment is Underwriters Laboratories listed. Accordingly, it will conform to the UL "Standards for Safety-Medical and Dental Equipment" (UL 544 - October 24, 1986) and is classified as "Patient Care Equipment."

"Patient Care Equipment" is defined as: "Equipment that is intended to be used on or with, or likely to be contacted by a patient in a health care facility in the course of his treatment."

Grounded patient care equipment is permitted to have a maximum current leakage of 100 microamperes to ground.

Typical current leakage of Ferno Ille mobile hydrotherapy units and components is between 40 and 70 microamperes to ground when measured per UL 544.

The current leakage test is performed by Underwriters Laboratories during investigation of a product. It is not a 100 percent production test. We are required to perform a 100 percent production dielectric strength test.

2.4 Specifications

Length:	12 in. (30.5 cm).
Width:	9.5 in. (24 cm).
Height:	11 in. (28 cm).
Height:	37 in. (94 cm).
Weight:	80.75 lbs. (36 Kg).
Input:	220-250 V AC 50/60 Hz, 10 Amps, single phase.
Output:	110-125 V AC 50/60 Hz, 20 Amps, single phase.

Section 3 Equipment Operation

3.1 Unpacking the Unit

Remove electrical converter from its shipping carton and remove the inner packaging.

3.2 Safety Precautions

WARNING!

Hydrotherapy units are not intended to be used with electrically susceptible patients. The UL definition of an electrically susceptible patient is: " A patient being treated with an externalized electrically conductive device (for example, a probe or catheter) indwelling or implanted and terminating on or in the heart". FAILURE TO OBSERVE WARNING MAY RESULT IN POSSIBLE FATAL INJURY TO PATIENT.

WARNING!

The unit must be properly grounded to ensure safe operation.

-Always make sure that the unit is in a dry place where there is no possibility of water from the use of the hydrotherapy equipment getting onto the converter.

-Never open the unit's case to attempt repair or for any other purpose.

-Do not cover the ventilation louvers on the converter's case.

FAILURE TO OBSERVE WARNING MAY RESULT IN SERIOUS INJURY OR DEATH TO PATIENT AND/OR PERSONNEL OPERATING THE EQUIPMENT OR DAMAGE TO THE UNIT AND CONNECTED EQUIPMENT.

3.3 Set-up and Operation

1. Insert the turbine's special 3-prong plug into the side of the tank's control panel. Press and twist the plug clockwise to lock it in place.

2. plug the tank's GFI power cord into the 3-prong grounded outlet on the side of the converter.

3. Connect the converter's power cord to the 230 V AC power supply.

4. Check the circuit breakers on the back of the unit. Red indicator indicates tripped condition. Press the tripped circuit breaker to reset. If the converter's circuit breakers continue to trip, contact your nearest Ferno Ille service facility to make arrangements for service.

NOTE: The converter will become warm during use. This condition is normal and is no cause for alarm.

3.4 Shutdown

1. Turn off the tank and turbine.

2. Disconnect tank from converter.

3. Disconnect converter from power source.

Section 4 Maintenance and Repair

Although the converter is designed to operate withminimal maintenance, it will require some care and maintenance to keep it operating safely during the many years that it will serve you.

4.1 Cleaning and Disinfection

NOTE: It is very important that these cleaning instructions be read and followed carefully. Failure to observe the following instructions may void your warranty.

> WARNING!
>
> ALWAYS UNPLUG THE ELECTRICAL CONVERTER BEFORE CLEANING. HIGH VOLTAGES ARE PRESENT INSIDE THE UNIT AND AT ITS CONNECTIONS. FAILURE TO OBSERVE WARNING MAY RESULT IN DEATH BY ELECTROCUTION.

The case of the electrical converter is constructed in part of AISI type 304 Stainless Steel for superior corrosion resistance. No metal however, is corrosion-proof. The converter requires thorough periodic cleaning to maintain its polished appearance.

When hydrotherapy equipment is used, a film comprised of body oils, organic material, minerals from the water, and other foreign material is deposited on the stainless surfaces. This film, if left on the equipment, will in time corrode the stainless steel, leaving pit marks on the surfaces.

1. Routine cleaning: Use Sanizene Hard Surface Disinfectant in solution, or soap or detergent. For occasional cleaning and polishing, use Steelscrub.

2. Stubborn spots and stains: Use a good stainless steel cleanser such as Ille Steelscrub and vinegar. Scrub the area with a cloth, sponge, stainless steel wool, or a cleaning pad. Let the cleanser stand for 5 minutes, wipe with a damp sponge, and wipe dry.

NOTE:
-Always rub in the same direction as the polish lines.
-Wipe dry to prevent water marks.
-Never use steel wool.

4.2 Troubleshooting

If the turbine and tank will not start, first check the GFI plug on the tank's power cord.

If there is no trip indication on the GFI, check the circuit breakers on the converter. If they are not tripped, check the power source.

If the power source is operating, the Electrical Converter needs to be serviced. See Repair Procedures, section 4.4, for repair information.

4.3 Scheduled Maintenance

Following is a suggested minimum interval electrical safety inspection schedule.

A. Weekly: Test GFI (ground-fault interruptor) plug on tank cord. Test instructions are on the plug.

B. Biannually:

1. Power supply cord should be flexible without cracks, cuts, or abrasions of the outer insulation. If the cord is cracked or otherwise damaged, it must be replaced. Contact your nearest authorized Ferno Ille service facility for repair.

2. Check your building's electrical outlets with a ground and polarity testing device (Hubbell #5200 or equiv.) to ensure that proper ground is maintained. If the outlets available are not suitable, have your electrician install a UL approved hospital-grade outlet before using the unit.

4.4 Repair Procedures

The Ferno Ille Electrical Converter contains no user serviceable or field replaceable parts. All repairs must be referred to an authorized Ferno Ille service facility. Requests for return authorization for repair should be directed to:

Ferno Ille Customer Service
70 Weil Way
Wilmington, OH 45177-9371

Phone: (513) 382-1451
(800) 73 FERNO
FAX (513) 382-1191

Index No.	Part No.	Part Description	No. Req'd
1	093-8089-00	Screw, nylon 1/4-20 x 1/2"	1
2	844-2728-00	Power cord (specify model and serial number)	1
3	093-8336-00	Spring slug	2
4	093-8376-00	Spring	1
5	093-8490-00	Suspension arm, painted, 4 1/8" (short)	1
6	093-8087-00	Screw, 8-32 x 3/8", round head	4
7	911-6194-00	Lockwasher, 3/8", split	4
8	093-9566-00	Water control rod assembly (medium)	1
9	093-8087-00	Screw, 8-32 x 3/8", round head	2
10	911-5904-00	Lockwasher, #8 shakeproof	2
11	093-4851-00	Impeller, 50/60 Hz units	1
12	093-6910-00	Cotter pin, 1/8 x 1 1/4"	1
13	093-8546-00	Switch cap	1
14	093-8556-00	Switch	1
15	911-5903-00	Bolt, 3/8-16 x 1 1/4", hex head	4
16	911-6194-00	Lockwasher, 3/8", split	4
17	093-8090-00	Screw, set, 10-32 x 1/4"	2
18	093-8877-00	Aerator tube assembly, (medium)	1
19	093-9156-00	Turbine tube, (medium)	1
20	093-8307-00	Shaft and Coupler assembly, (medium)	1
21	093-7996-00	Retainer ring (set of 2)	1
22	093-0128-00	Bearing, rubber w/ cotter pin	1
23	093-8088-00	Screw, 8-32 x 1/2", round head	1
24	093-4836-00	Turbine housing cover assembly*	1
25	093-8088-00	Screw, 8-32 x 1/2", round head	4
xx	095-0310-00	Motor, dual-voltage, 50/60 Hz	1
xx	095-0309-00	Motor cap, wine colored	1

*sold as an assembly which includes: housing, cover, guard cover, (7) screws, and (2) lockwashers.

Index No.	Part No.	Part Description
1	093-8089-00	Screw, nylon 1/4-20 x 1/2"
2	844-2728-00	Power cord (specify model and serial number)
3	093-8336-00	Spring slug
4	093-8376-00	Spring
5	093-8505-00	Suspension arm, painted, 4 1/8" (short)
6	093-8087-00	Screw, 8-32 x 3/8", round head
7	911-6194-00	Lockwasher, 3/8", split
8	093-9566-00	Water control rod assembly (medium)
9	093-8087-00	Screw, 8-32 x 3/8", round head
10	911-5904-00	Lockwasher, #8 shakeproof
11	093-4851-00	Impeller, 50/60 Hz units
12	093-6910-00	Cotter pin, 1/8 x 1 1/4"
13	093-8546-00	Switch cap
14	093-8556-00	Switch
15	911-5903-00	Bolt, 3/8-16 x 1 1/4", hex head
16	911-6194-00	Lockwasher, 3/8", split
17	093-8090-00	Screw, set, 10-32 x 1/4"
18	093-8877-00	Aerator tube assembly, (medium)
19	093-9156-00	Turbine tube, (medium)
20	093-8307-00	Shaft and Coupler assembly, (medium)
21	093-7996-00	Retainer ring (set of 2)
22	093-0128-00	Bearing, rubber w/ cotter pin
23	093-8088-00	Screw, 8-32 x 1/2", round head
24	093-4836-00	Turbine housing cover assembly*
25	093-8088-00	Screw, 8-32 x 1/2", round head
xx	095-0310-00	Motor, dual-voltage, 50/60 Hz
xx	095-0309-00	Motor cap, wine colored

*sold as an assembly which includes: housing, cover, guard cover, (7) screws, and (2) lockwashers.

Index No.	Part No.	Part Description
1	093-8089-00	Screw, nylon 1/4-20 x 1/2"
2	844-2728-00	Power cord (specify model and serial number)
3	093-8336-00	Spring slug
4	093-8376-00	Spring
5	093-8505-00	Suspension arm, painted, 4 1/8" (short)
6	093-8087-00	Screw, 8-32 x 3/8", round head
7	911-6194-00	Lockwasher, 3/8", split
8	093-9566-00	Water control rod assembly (medium)
9	093-8087-00	Screw, 8-32 x 3/8", round head
10	911-5904-00	Lockwasher, #8 shakeproof
11	093-4851-00	Impeller, 50/60 Hz units
12	093-6910-00	Cotter pin, 1/8 x 1 1/4"
13	093-8546-00	Switch cap
14	093-8556-00	Switch
15	911-5903-00	Bolt, 3/8-16 x 1 1/4", hex head
16	911-6194-00	Lockwasher, 3/8", split
17	093-8090-00	Screw, set, 10-32 x 1/4"
18	093-8877-00	Aerator tube assembly, (medium)
19	093-9156-00	Turbine tube, (medium)
20	093-8307-00	Shaft and Coupler assembly, (medium)
21	093-7996-00	Retainer ring (set of 2)
22	093-0128-00	Bearing, rubber w/ cotter pin
23	093-8088-00	Screw, 8-32 x 1/2", round head
24	093-4836-00	Turbine housing cover assembly*
25	093-8088-00	Screw, 8-32 x 1/2", round head
xx	095-0310-00	Motor, dual-voltage, 50/60 Hz
xx	095-0309-00	Motor cap, wine colored

*sold as an assembly which includes: housing, cover, guard cover, (7) screws, and (2) lockwashers.